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STATISTICAL BULLETIN
Metropolitan Life Insurance Co.

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THE PROBABILITY OF DYING OF CANCER.

Discussions of cancer mortality have in the past centered around the measure called the cancer deathrate, or the number of deaths per 100,000 persons exposed to risk for one year in a given group of the population. Such deathrates have been subjected to various comparisons, and conclusions have been drawn with respect to the trend of fatal cancers in various divisions of the population and in various periods of time. But these comparisons have so far given little if any real indication of the true tendency of the cancer menace. This can be obtained only as we can answer the questions so often put to workers in the cancer control movement: "What is the probability of my dying from cancer?" and "How has this chance or probability increased or decreased in the last ten or twenty years?"

We may or may not be dealing with a rising cancer deathrate. As we have pointed out in recent BULLETINS, nothing definite can be said with respect to the crude figures available for whole populations combined. The evidence is confusing even when the necessary details of calculation are taken into account for color, age and sex of populations. But even if a stationary cancer deathrate were taken for granted, we have at the same time been confronted with rapidly declining deathrates for certain other diseases such as tuberculosis, pneumonia, typhoid fever, etc., and consequently with a distinct upward trend of the average age of the population. This means that more and more persons are surviving at the earlier ages and find themselves at age divisions where cancer deathrates are high. In a population not disturbed by migration this would mean an increase in the absolute number of cancer deaths year after year even with a condition of stationary cancer deathrates at specific age periods. Changes in the deathrates of other diseases than cancer at the ad-

vanced ages also affect the total cancer budget of a generation of people gradually advancing toward old age. And so, the real risk of death from cancer cannot be determined until the course of mortality from other diseases is taken into consideration.

This can be done readily enough through the construction of a so-called "life-table" which shows the effect upon an initial generation of, say, 100,000 persons at birth of the deathrates from cancer and from other diseases and conditions in successive ages. The number of deaths due to cancer in such a life-table population can be determined. By dividing the number of these cancer deaths at and above a specified age by the number of persons living at the beginning of the age interval, a measure of the probability of dying eventually from cancer can be determined. In the following table we show the facts for males and females at specified single ages in the United States Registration States of 1921. This table shows the probability of dying from cancer to be .0722 for males at age 5, and for females at this age, .1015. That is to say, under the deathrates prevailing in 1921 for cancer and other diseases, on the assumption that these rates would persist throughout the lifetime of persons alive in 1921, males at age 5 had seven chances out of a hundred of dying eventually from cancer, and females a chance of ten in a hundred.

Measure of the Chance of a Death from Cancer at and Above Selected Ages, United States Registration States, 1921. By Sex.

Age	Males	Females	Per Cent. Male of Female Probability
5	.0722	.1015	71
10	.0730	.1025	71
15	.0739	.1036	71
20	.0751	.1055	71
25	.0766	.1077	71
30	.0781	.1099	71
35	.0796	.1116	71
40	.0813	.1123	72
45	.0826	.1112	74
50	.0834	.1079	77
55	.0827	.1025	81
60	.0798	.0949	84
65	.0747	.0855	87
70	.0668	.0747	89
75	.0558	.0619	90
80	.0440	.0494	89
85	.0332	.0400	83
90	.0223	.0264	84
95	.0182	.0133	137

The table on page 2 answers the first question we have put, namely: What is the probability of a person at a certain age ultimately dying of cancer? The second question is: Has there been any change during recent years in the risk of dying eventually of cancer? The following table makes it possible to answer this question. The table relates to two geographic areas, which, while not absolutely identical, were nearly coextensive; and the comparisons are valid.

Measure of the Chance of Dying from Cancer at and Above Selected Ages. United States Registration States, 1921, and Area, 1910. By Sex.

Age	Males		Females		Percentage Increase Between 1910 and 1921	
	1921	1910	1921	1910	Males	Females
5	.0722	.0484	.1015	.0840	49.2	20.8
10	.0730	.0490	.1025	.0851	49.0	20.4
15	.0739	.0497	.1036	.0862	48.7	20.2
20	.0751	.0507	.1055	.0880	48.1	19.9
25	.0766	.0521	.1077	.0903	47.0	19.3
30	.0781	.0537	.1099	.0926	45.4	18.7
35	.0796	.0554	.1116	.0944	43.7	18.2
40	.0813	.0573	.1123	.0953	41.9	17.8
45	.0826	.0587	.1112	.0941	40.7	18.2
50	.0834	.0593	.1079	.0904	40.6	19.4
55	.0827	.0588	.1025	.0848	40.6	20.9
60	.0798	.0565	.0949	.0765	41.2	24.1
65	.0747	.0516	.0855	.0676	44.8	26.5
70	.0668	.0448	.0747	.0568	49.1	31.5
75	.0558	.0364	.0619	.0456	53.3	35.7
80	.0440	.0285	.0494	.0336	54.4	47.0
85	.0332	.0216	.0400	.0238	53.7	68.1
90	.0223	.0140	.0264	.0161	59.3	64.0
95	.0182	.0132	.0133	.0079	37.9	68.4

This table shows that the real risk of dying from cancer increased from 40 to nearly 60 per cent. at various ages for males and from about 18 to nearly 70 per cent. for females between 1910 and 1921. The heavier increases at the later ages affect, however, only a small number of lives exposed in a life-table population. In these data we see in part the effect of the greater fall in the deathrates from tuberculosis and other preventable diseases among males than among females. This is very different from the impression which is given by the trend of the *deathrate* from cancer in the same calendar period. The reason is, of course, that these new figures take into

account the effect of transferring to the ages of greatest cancer risk the lives saved at the earlier ages from preventable disease as well as the changes in deathrates at advanced ages for diseases characteristic of this range of life. It would be desirable to have for the Registration Area, suitable life-table materials for the years intervening between 1910 and 1921. These would provide data for determining more exactly the underlying trend of these probabilities at the several ages. In a later BULLETIN we purpose to give the facts in form parallel to the above for wage-earners insured in the Industrial Department of this Company.

CERTAIN ASPECTS OF THE MORTALITY FROM SUICIDE.

Approximately three men commit suicide each year to every woman who destroys her own life. These ratios, however, relate to all suicides. The figures for the several means of self-destruction show very different ratios for the two sexes.

The suicide statistics of many years show that firearms are the commonest means employed by males; women do not often take their lives in this manner. In 1920, for example, there were more than seven times as many suicides by firearms among men in the country as among women. Hanging is next in importance to firearms among males; but this means also is rarely chosen by women.

Suicide by poison is the means most frequently employed by women. And there have been certain years in which the deathrate of females from this method of self-murder actually exceeded that of males. There is, in fact, a certain age period, namely, between 15 and 35 years in which, year-in and year-out, more women than men take their lives by means of poison.

A study of the deathrates for suicide by poison brings out two interesting facts. The first is that it is now far less important, numerically, than it was a decade or more ago. Among males insured in the Industrial Department of the Metropolitan Life Insurance Company, for example, the deathrate for 1922 was less than one-fourth of the 1911 figure; and among females it was less than one-half. The second fact is that a few years ago, more men than women destroyed themselves by taking poison. With the decline in the deathrate, however, there has been a gradual change in this relationship for the two sexes, and in three of the four latest years there has been observed a higher deathrate among women.

The table on page 5 shows these facts clearly.

Deathrates Per 100,000 from Suicide by Poison. By Sex. Metropolitan Life Insurance Company. Industrial Department. 1911 to 1922.

Year	Death Rates Per 100,000		Year	Death Rates Per 100,000	
	Males	Females		Males	Females
1911.....	6.9	4.1	1917	2.5	2.1
1912.....	6.3	3.6	1918	1.5	1.5
1913.....	6.8	3.6	1919	1.3	1.4
1914.....	6.4	3.4	1920	1.0	1.4
1915.....	4.4	3.4	1921	1.8	1.4
1916.....	3.4	2.3	1922	1.6	1.9

Next to solid and liquid poisons, asphyxiation is the most common method of suicide among females. In fact, a study of the suicide deathrates over a long period of years emphasizes strongly the fact that the means of self-destruction chosen by women are usually the relatively slow methods and those which do not tend so much to result in disfigurement of the body or in the drawing of blood.

LONGEVITY OF LOCOMOTIVE ENGINEERS, 1912 AND 1922.

The special hazards of the locomotive engineer's occupation seem not to reduce his longevity prospect below that of males in the general population. From figures recently submitted by the Locomotive Engineers' Mutual Life and Accident Insurance Association, it was calculated in our office that the American locomotive engineer in 1922 at the age of 28 had an expectation of 41.14 years, and this may be compared with the figure of 40.55 years for 1921 among males in the United States Registration States at age 27*. The mortality experience of American males insured in the Ordinary departments of life insurance companies for the period 1900–1915 showed an expectation of 39.36 years at age 28. This figure would now be much higher in view of the vastly improved mortality experience since the table was prepared. Locomotive engineers, therefore, appear to have an expectation of life about as good as that for the average American male of corresponding age.

The last ten years have seen a substantial decline in mortality among locomotive engineers. Between ages 31 and 55, the declines

**Life table values for United States Registration States available only at central ages, e. g., 27 32, 37, etc.*

ranged from 32 to 44 per cent. Beyond age 55, the evidence is not clear because of the relatively small numbers exposed to risk. In the following table we show certain age data for mortality from all causes of death combined.

Deathrates Per 1,000, and Expectation of Life, at Specified Ages. Brotherhood of Locomotive Engineers, 1922 and 1912.

Age Period	Deathrate per 1,000			Expectation of Life					
				B. of L. E., 1922		U. S. Reg. States Males, 1921		Amer. Men Ult. 1900–1915	
	1922	1912	Per Cent. Decline, 1922–1912	Central age	Exp. of life	Central age	Exp. of life	Central age	Exp. of life
26 to 30	2 89	2 89	——	28	41 14	27	40 55	28	39 36
31 to 35	2 96	4 73	37 4	33	36 68	32	36 46	33	35 19
36 to 40	4 19	7 42	43 5	38	32 27	37	32 41	38	30 99
41 to 45	6 08	9 69	37 3	43	28 00	42	28 47	43	26 84
46 to 50	7 81	11 54	32 3	48	23 86	47	24 61	48	22 83
51 to 55	12 56	19 30	34 9	53	19 87	52	20 87	53	19 05
56 to 60	25 05	25 03	1*	58	16 45	57	17 36	58	15 58
61 to 65	28 95	34 01	14 9	63	13 39	62	14 12	63	12 47
66 to 70	51 72	55 85	7 4	68	10 57	67	11 23	68	9 77
71 to 75	85 75	70 77	21 2*	73	8 71	72	8 75	73	7 49
76 to 80	94 67	103 45	8 5	78	7 31	77	6 68	78	5 62
81 to 85	100 78	295 45	65 9	83	5 15	82	5 06	83	4 14

*Increase.

The most gratifying fact in this mortality experience is the decline in the accident deathrate. In 1912, fatal accidents occurred at a rate of 318 per 100,000; in 1922, the rate was 167 per 100,000. This reduction of nearly one-half reflects a vast improvement in safety provisions for the operating personnel of our American railway systems and accounts for a large part of the saving in mortality at the age range from 31 to 55 years. The typhoid fever deathrate for this occupation declined from 29 per 100,000 in 1912 to 2 per 100,000 in 1922. The tuberculosis deathrate showed a drop from 55 to 40 per 100,000 in ten years.

Increases were recorded in the crude deathrates for certain of the diseases characteristic of middle life and old age. Bearing in mind the change in age distribution of this group between 1912 and 1922, we "standardized" the calculation of deathrates for diseases of the heart and blood vessels, that is to say, we assumed the age distribution of 1922 to hold for 1912 also, and found that for organic heart disease the deathrate in 1922 was 74 per cent. higher than in 1912. Among males in the United States Registration Area, between 1910 and 1921, there was a decrease of 9 per cent. for comparable ages in the standardized deathrate. For cerebral hemorrhage and apoplexy, the increase in the deathrate between 1912 and 1922 was 11.4 per

cent., but among males in the general population there was a decrease of 2.2 per cent. These increases in the deathrate for two important diseases of middle life and old age were not sufficient, however, to affect adversely the life expectation figures, possibly, because most of the deaths fell in the advanced ages having a small proportion of the total exposure to risk.

Bright's disease showed a decrease of 36 per cent. between 1912 and 1922 for locomotive engineers as compared with a decrease of 23 per cent. for males in the general population.

To our knowledge, this is the first time that a life-table has been prepared and published from adequate data for a specific occupation in American industry. The value of this table suggests the desirability of preparing similar tables for other groups of personnel in the principal industries of the country. Once the facts are ascertained for the exposure to risk and the deaths according to ages, the calculation of a life-table is relatively simple.

MORTALITY IN THE FIRST MONTH OF LIFE ACCORDING TO NATIVITY OF MOTHER.

If the ability to survive the first month of life is a good index of vitality, the children of the foreign stocks are at least as vigorous as are those whose mothers are native born. This conclusion, so important at this time when the immigration policy of the country is being crystallized, is made possible from an analysis of certain figures issued during the last five years by the Census Bureau of the Federal Government. These data are for the years 1917–1921 and have been compiled for the Birth Registration Area of the United States, which now includes more than half the total population. The table on page 8 shows the early infant mortality for boys and for girls by nativity of mother.

Mortality Rates of White Children in the First Month of Life, by Sex and by Country of Birth of Mother.
U. S. Birth Registration Area, 1917-1921.

Country of Birth of Mother	Deaths Under One Month of Age Per 1,000 Births	
	Males	Females
United States	46.0	35.6
Total foreign	44.4	34.1
Austria	50.9	38.7
Hungary	44.9	34.8
Canada	54.5	43.0
Denmark, Norway, Sweden	41.2	32.1
England, Scotland, Wales	44.4	35.6
Ireland	50.5	38.8
Germany	45.8	35.7
Italy	37.0	29.0
Poland	54.5	41.6
Russia	38.5	28.4

During this five-year period, the infant mortality for the first month of life was 46.0 per 1,000 for male infants whose mothers were native born, as against 44.4 per 1,000 for male infants whose mothers were foreign born. The figures are somewhat higher for infants whose mothers are of certain foreign nativities. Male infants whose mothers were either Polish or Canadian showed the highest rates, 54.5. These were followed by male infants whose mothers were born in Austria, 50.9; and in Ireland, 50.5. The lowest rates are for those whose mothers were born in Italy, 37.0 and in Russia 38.5.

The figures for infant girls are lower than for boys, but the rank according to nativity of mother is very much the same as for the boys.

HEALTH RECORD FOR NOVEMBER, 1923.

The low November deathrate among Metropolitan Industrial policyholders (7.8 per 1,000) emphasizes the very satisfactory health situation now prevailing throughout the United States and Canada. This is the minimum ever recorded in November among this large group. Furthermore, it represents a decline from the October deathrate of 8.0 per 1,000 and this decline has taken place at a time of the year when we expect a seasonal increase.

Analysis of the deathrates for the several principal diseases in the table on page 11 fails to bring out a single unsatisfactory item, unless it be cancer. It is true that in a few instances the rate was higher than for November a year ago. But in no instance, except cancer, is the comparison particularly unfavorable if made with more remote years. Accidents, as a whole, registered a slight decline as compared with November of last year, although there was the usual increase for automobile fatalities.

The general deathrate in the large cities of the United States in November was 12.2 per 1,000, which is the same as for the corresponding month of last year. There was registered, however, a small increase, among the general population, over the October figure of this year. Increased prevalence of diphtheria, influenza, measles, scarlet fever, smallpox and whooping cough was reported throughout the United States as compared with October, although there were fewer cases of malaria, poliomyelitis and typhoid fever. As compared with November, 1922, there was more malaria, measles, poliomyelitis, scarlet fever and smallpox cases, with less diphtheria, influenza and whooping cough.

One of the outstanding developments in the health situation during November was the increased prevalence of smallpox, particularly in California, Indiana and Michigan. From California 311 cases were reported during the first four weeks of November as compared with 116 during October and 37 during November, 1922. A sharp rise in smallpox cases occurred in the Southern part of the state. Indiana reported 138 cases during the first four weeks of November as compared with 61 in October and 49 in November, 1922. The rise in Michigan was from 155 cases in October to 384 for the first four weeks of November. In Detroit, 38 cases were reported in 24 November days as compared with 18 for the whole month of October. Three cases of smallpox near Crooksville, Ohio were reported and a warning was issued throughout the county urging protective measures to combat the spread of the disease. Students at the Woodward Technical High School and the Oakdale School in Toledo, Ohio are being vaccinated or temporarily quarantined as a result of the discovery of several cases. While the number of smallpox cases is not large, the rapidity with which they have been developing in some localities is disturbing.

The number of reports of typhoid fever is greatly diminished. Two outbreaks were noted last month in Evanston, Illinois and St.

Jerome, Quebec. In the latter two persons died and about 100 were reported ill in an epidemic caused by drinking polluted water.

Although measles is by no means as prevalent as during the first part of the year, increases over recent months are being reported from certain localities. There was quite a sharp rise in measles cases during November in Kansas, Oregon and Washington.

An outbreak of diphtheria was reported from Zion City, Illinois. The appearance of more than twenty cases caused an investigation by the State Department of Health.

Six cases of typhus fever were reported in Los Angeles during the two weeks ended November 17th, and new cases of leprosy were reported from Massachusetts, Maryland, Texas and California.

Among the outstanding public health activities of the month are the following: An industrial health survey under the direction of the Milbank Fund was considered November 5th at Syracuse by the Chamber of Commerce and the Manufacturers' Association. Plans for the improvement of public health in Tennessee were discussed at a meeting of the Health and Sanitation Committee of the Nashville Chamber of Commerce. It was agreed that an effort would be made to have legislation enacted providing for the establishment of more county health units and rural sanitation agencies and for the eradication of epidemic and venereal diseases. In Philadelphia the Director of Public Health announced on November 3d that immediate arrest of employment officials and others concerned in hiring men and women would follow the ignoring of an order which requires vaccination certificates from applicants. A full-time health department will be established in Natrona County, Wyoming. This will be operated under the supervision of the Rockefeller Foundation in cooperation with city, state, and school authorities.

The table below shows the mortality among the Industrial policyholders for November, 1923; October, 1923; November, 1922 and for the year 1922.

METROPOLITAN LIFE INSURANCE COMPANY.

Deathrates Per 100,000 for Principal Causes, Premium-paying Business in Industrial Department. (Annual Basis.)

MONTHS OF OCTOBER AND NOVEMBER, 1923, AND OF NOVEMBER, 1922.

CAUSES OF DEATH	RATE PER 100,000 LIVES EXPOSED			
	Nov., 1923	Oct., 1923	Nov., 1922	Year 1922
TOTAL—ALL CAUSES	778.8	797.3	817.9	882.9
Typhoid fever	5.1	6.6	6.0	5.7
Measles	1.5	1.0	2.2	4.3
Scarlet fever	3.4	2.2	4.1	4.9
Whooping cough	2.4	2.3	1.8	2.6
Diphtheria	16.9	16.6	25.2	18.0
Influenza	6.8	4.1	7.0	21.7
Tuberculosis (all forms)	88.4	96.4	90.5	114.2
Tuberculosis of resp'y system	81.4	87.7	82.3	103.6
Cancer	71.0	77.4	69.2	72.0
Diabetes mellitus	12.8	14.5	*	17.2
Cerebral hemorrhage	55.6	57.5	53.5	62.9
Organic diseases of heart	119.1	114.8	121.4	126.7
Pneumonia (all forms)	59.2	43.6	63.0	73.7
Other respiratory diseases	12.8	8.6	14.8	13.7
Diarrhea and enteritis	6.0	11.7	8.8	10.8
Bright's disease (chronic nephritis)	62.0	65.1	69.3	70.3
Puerperal state	14.2	14.8	15.2	19.0
Suicides	6.0	6.5	4.8	7.5
Homicides	9.0	9.7	5.5	6.3
Other external causes (excluding suicides and homicides)	59.2	67.5	60.1	58.1
Traumatism by automobile	16.7	19.4	15.1	13.6
All other causes	167.4	176.5	195.5	173.3

*Not available.

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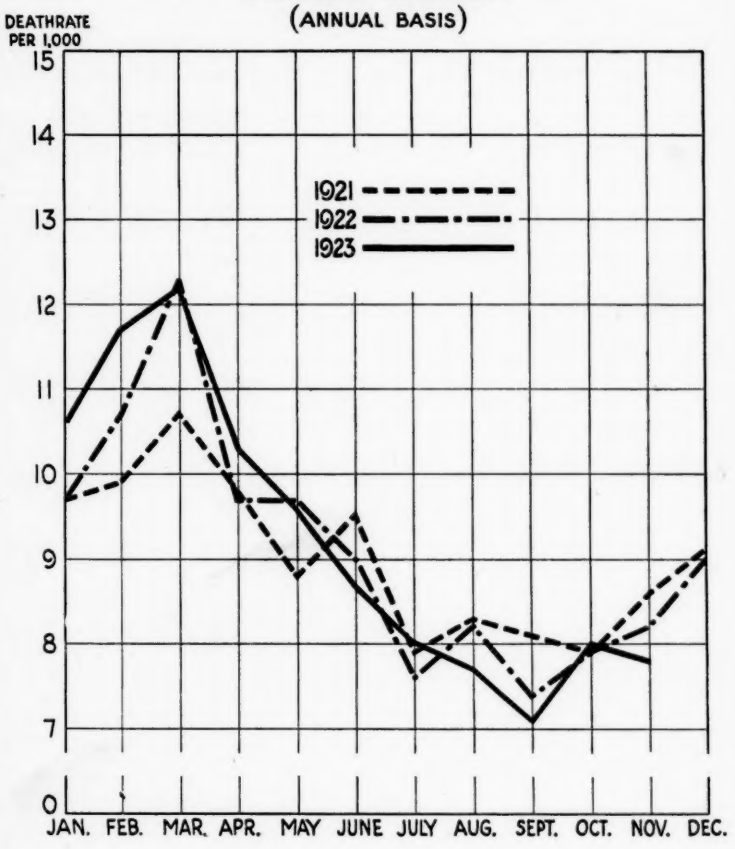
DEATHRATE PER 1,000
in SPECIFIED MONTHS *of*
1921-1922-1923

METROPOLITAN LIFE INSURANCE COMPANY
INDUSTRIAL DEPARTMENT
(ANNUAL BASIS)



	1921	1922	1923
JAN.	9.7	9.7	10.6
FEB.	9.9	10.7	11.7
MAR.	10.7	12.3	12.2
APR.	9.8	9.7	10.3
MAY	8.8	9.7	9.6
JUNE	9.5	9.0	8.8

	1921	1922	1923
JULY	7.9	7.6	8.0
AUG.	8.3	8.2	7.7
SEPT.	8.1	7.4	7.1
OCT.	7.9	7.9	8.0
NOV.	8.6	8.2	7.8
DEC.	9.1	9.0	

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